

CLAIMS

What is claimed is:

1. A method of adhering a thermoplastic elastomeric composition to a solid substrate, comprising:

- (a) dynamically vulcanizing a fluoroelastomer in the presence of a thermoplastic material and curing agent for a time less than that needed to completely cure the fluoroelastomer, to form a partially cured thermoplastic vulcanizate;
- (b) applying an adhesive layer to said substrate;
- (c) bringing said partially cured thermoplastic vulcanizate into contact with said adhesive layer; and
- (d) completing the curing of said thermoplastic vulcanizate.

2. A method according to Claim 1, wherein said bringing process element (c) comprises insertion molding said partially cured thermoplastic vulcanizate onto said adhesive covered substrate.

3. A method according to Claim 2, wherein said substrate is a metal.

4. A method according to Claim 1, wherein said substrate is a plastic.

5. A method according to Claim 4, wherein said bringing process element (c) comprises co-extruding said partially cured thermoplastic vulcanizate with said substrate.

6. A method according to Claim 5, wherein said applying process element (b) and said bringing process element (c) comprise co-extruding said adhesive layer, said partially cured thermoplastic vulcanizate, and said substrate.

7. A method according to Claim 6, wherein said adhesive layer is applied during said co-extrusion with a liquid continuous injection unit.

8. A method according to Claim 1, wherein said curing agent comprises a bisphenol.

9. A method according to Claim 1, wherein said curing agent comprises a peroxide.

10. A method of making a composite article comprising:

(a) applying a partially cured thermoplastic elastomer composition onto a substrate, wherein said thermoplastic elastomer composition comprises a discrete phase of a partially cured fluoroelastomer and a continuous phase of a thermoplastic polymeric material; and

(b) curing said partially cured thermoplastic elastomer composition.

11. A method according to Claim 10, wherein the partially cured thermoplastic elastomer composition comprises a partially cured dynamic vulcanizate of a fluoroelastomer and a thermoplastic material.

12. A method according to Claim 10, wherein said fluoroelastomer is a copolymer of vinylidene fluoride.

13. A method according to Claim 10, further comprising forming the partially cured thermoplastic elastomer composition by a process comprising mixing together said fluoroelastomer, said thermoplastic material, and a curing agent while heating to effect partial curing of said fluoroelastomer in the presence of said thermoplastic.

14. A method according to Claim 13, wherein said thermoplastic material comprises a fluoroplastic.

15. A method according to Claim 13, wherein said thermoplastic material comprises a non-fluorine containing thermoplastic.

16. A method according to Claim 13, wherein said thermoplastic material comprises a partially fluorinated thermoplastic.

17. A method according to Claim 13, wherein said curing agent comprises a bisphenol.

18. A method according to Claim 13, wherein said curing agent comprises a peroxide.

19. A method according to Claim 10, wherein said substrate comprises an adhesive layer on a solid support, and said partially cured composition is applied onto said adhesive layer.

20. A method according to Claim 10, wherein said applying process element (a) comprises insertion molding said partially cured composition onto said substrate.

21. A method according to Claim 10, wherein said applying process element (a) comprises co-extruding said partially cured composition and said substrate.

22. A method of making a polymeric composite article, comprising:

- (a) making a partially cured dynamic vulcanizate having a fluoroelastomer discrete phase and a thermoplastic continuous phase;
- (b) co-extruding said partially cured dynamic vulcanizate with a substrate;
and
- (c) completing the cure of said co-extruded partially cured dynamic vulcanizate.

23. A method according to Claim 22, wherein an adhesive layer is co-extruded between said partially cured dynamic vulcanizate and said substrate.

24. A method according to Claim 22, wherein a liquid adhesive is injected between said partially cured dynamic vulcanizate and said substrate during said co-extrusion process element (b).

25. A method according to Claim 22, comprising making said partially cured dynamic vulcanizate by a process comprising mixing together a fluoroelastomer resin, a thermoplastic polymeric material, and a curing agent that reacts with said fluoroelastomer resin while heating to cause reaction of said fluoroelastomer resin and curing agent, for a time corresponding to T90 or less of said fluoroelastomer.

26. A method according to Claim 25, wherein said fluoroelastomer resin comprises an uncured copolymer of monomer selected from the group consisting of hexafluoropropylene, vinylidene fluoride, tetrafluoroethylene, and mixtures thereof.

27. A method according to Claim 25, wherein said curing agent comprises a bisphenol.

28. A method according to Claim 25, wherein said curing agent comprises a peroxide.

29. A method for making a composite article comprising a cured fluoroelastomer composition on a solid metal substrate using a mold, said method comprising:

- (a) applying an adhesive layer onto said substrate;
- (b) placing said adhesive covered substrate into said mold;
- (c) insertion molding a partially cured elastomer composition to contact said substrate in the mold; and
- (d) completing the cure of said elastomer composition;

wherein said partially cured elastomer comprises a discrete phase comprising partially cured fluorocarbon elastomer and a continuous phase comprising a fluorine containing thermoplastic material.

30. A method according to Claim 29, further comprising making said partially cured elastomer by a process comprising mixing together a fluoroelastomer resin, a thermoplastic polymeric material, and a curing agent that reacts with said fluoroelastomer resin while heating to cause reaction of the resin and curing agent, wherein said resin is characterized by a curing time T90, and said curing reaction is carried out for a time less than T90.

31. A method according to Claim 30, wherein said mixing is carried out in a twin-screw extruder.

32. A method according to Claim 30, wherein said fluoroelastomer resin comprises a copolymer of vinylidene fluoride, hexafluoropropylene, and tetrafluoroethylene.

33. A method according to Claim 30, wherein said curing agent comprises a bisphenol.

34. A method according to Claim 30, wherein said curing agent comprises a peroxide.

35. A method for adhering a thermoplastic fluorocarbon elastomer composition onto a substrate using a twin screw extruder having a first port and a second downstream port, said method comprising:

- (a) feeding a mixture of unmixed fluorocarbon elastomer and thermoplastic material said first port of said extruder, wherein the uncured elastomer is characterized by a time T90;
- (b) feeding a curing agent for said fluorocarbon elastomer into said second port said first port;
- (c) mixing said curing agent, fluorocarbon elastomer, and thermoplastic material in said extruder for a time of T90 or less to make a partially cured thermoplastic vulcanizate of the fluorocarbon elastomer;
- (d) extruding said partially cured thermoplastic vulcanizate from said extruder;
- (e) applying said thermoplastic vulcanizate onto said substrate, and
- (f) completing the cure of said thermoplastic vulcanizate on said substrate.

36. A method according to Claim 35, wherein said applying process element (d) comprises insertion molding said partially cured thermoplastic vulcanizate into a mold containing said substrate.

37. A method according to Claim 35, comprising co-extruding said partially cured thermoplastic vulcanizate with said substrate.

38. A method according to Claim 35, wherein said fluorocarbon elastomer comprises a copolymer of vinylidene fluoride, hexafluoropropylene, and tetrafluoroethylene.

39. A method according to Claim 35, wherein said curing agent comprises a bisphenol.

40. A method according to Claim 35, wherein said curing agent comprises a peroxide.

41. A method according to Claim 35, wherein said thermoplastic material comprises a fluoroplastic.

42. A method according to Claim 35, wherein said thermoplastic material comprises a partially fluorinated fluoroplastic.

43. A method according to Claim 35, wherein said thermoplastic material comprises a non-fluorine containing thermoplastic.